

1. An optoelectronic device comprising:
 - an evacuated chamber;
 - a negatively-biased source electrode disposed within the evacuated chamber and having a source lead extending outside the evacuated chamber;
 - a collector electrode disposed within the evacuated chamber and having a collector lead extending outside the evacuated chamber, wherein there is a beam impedance between the source lead and the collector lead;
 - a laser generator adapted to emit radiation that is focused on the source electrode to stimulate emission of rapidly varying electrical current from the source electrode;
 - an impedance matching device coupled to the source lead and the collector lead or incorporated in them; and
 - a connector coupled to the impedance matching device, the connector adapted to couple to a second impedance, wherein the impedance matching device is adapted to match the first impedance to the second impedance.
2. The device of claim 1, wherein the impedance matching device causes a narrow-band impedance match by having a series reactance and a parallel susceptance.
3. The device of claim 2, wherein the series reactance comprises inductive or capacitive components.
4. The device of claim 3, wherein the series reactance has a value approximately equivalent to the square root of the product of the first impedance and the second impedance.

5. The device of claim 2, wherein the parallel susceptance comprises inductive or capacitive components.

6. The device of claim 5, wherein the parallel susceptance has a value approximately equivalent to the reciprocal of the square root of the product of the first impedance and the second impedance.

7. The device of claim 6, wherein the first impedance is approximately 100,000,000 Ohms.

8. The device of claim 7, wherein the second impedance is approximately 50 Ohms.

9. The device of claim 1, wherein the impedance matching device comprises a wide-band impedance match having an autotransformer coupled to the source lead and a coupling capacitor coupled to the autotransformer and coupled to the connector.

10. The device of claim 9, wherein the autotransformer has a ferrite core.

11. The device of claim 1, wherein the impedance matching device comprises a wide-band impedance match comprising:

a center conductor having a first end and a second end and having a diameter that tapers to a point at a first end, wherein the point forms the source electrode having the first impedance, and wherein the center conductor has a second diameter at the second end that is coupled to the connector that is adapted to couple to the second impedance; and

a substantially cylindrical outer conductor disposed around the center conductor in a coaxial fashion, the outer conductor having a radius smaller than a wavelength of the rapidly varying electrical current from the source electrode.

12. The device of claim 1, wherein the impedance matching device comprises a wide-band impedance match comprising:

a first stripline having a first end and a second end, the first stripline having a width that tapers to a point at the first end, wherein the point forms the source electrode having the first impedance, and wherein the first stripline has a second width at the second end that is coupled to the connector that is adapted to couple to the second impedance; and

a second stripline having a third end and a fourth end, the second stripline having a width that tapers to a point at the third end and having a fourth width at the fourth end.

13. For use with an optoelectronic device comprising an evacuated chamber having a negatively-biased source electrode and a collector electrode disposed therein, wherein the source and collector electrodes have a first impedance, a laser generator adapted to emit radiation that is focused on the source electrode to stimulate emission of a rapidly varying electrical current from the source electrode, and a connector adapted to couple to a second impedance, an impedance match adapted to match the first impedance to the second impedance, comprising:

a center conductor having a first end and a second end and having a diameter that tapers to a point at the first end, wherein the point forms the source electrode having the first impedance, and wherein the center conductor has a second diameter at the second end that is coupled to the connector that is adapted to couple to the second impedance; and

an substantially-cylindrical outer conductor forming the collector electrode, the outer conductor being disposed around the center conductor in a coaxial fashion, the outer conductor having a radius smaller than a wavelength of the rapidly varying electrical current from the source electrode.

14. The impedance matching device of claim 13, wherein the first impedance is approximately 100,000,000 Ohms.

15. The impedance matching device of claim 14, wherein the second impedance is approximately 50 Ohms.

16. The impedance matching device of claim 12, wherein the center conductor tapers linearly from the point at the first end to the second diameter at the second end.

17. The impedance matching device of claim 13, wherein the center conductor tapers exponentially from the point at the first end to the second diameter at the second end.

18. The impedance matching device of claim 15, wherein the center conductor tapers according to a Gaussian taper from the point at the first end to the second diameter at the second end.

19. The impedance matching device of claim 15, wherein the center conductor tapers according to a Dolph-Chebyshev taper from the point at the first end to the second diameter at the second end.

20. The impedance matching device of claim 15, wherein the center conductor tapers according to a Klopfenstein taper from the point at the first end to the second diameter at the second end.

21. For use with an optoelectronic device comprising an evacuated chamber having a negatively-biased source electrode and a collector electrode disposed therein, wherein the source and collector electrodes have a first impedance, a laser generator adapted to emit radiation that is focused on the source electrode to stimulate emission of a rapidly varying electrical current from the source electrode, and a connector adapted to couple to a second impedance, an impedance matching device adapted to match the first impedance to the second impedance, comprising:

a first stripline having a first end and a second end, the first stripline having a width that tapers to a point at the first end, wherein the point forms the source electrode having the first impedance, and wherein the first stripline has a second width at the second end that is coupled to the connector that is adapted to couple to the second impedance; and

a second stripline forming the collector electrode, the second stripline having a third end and a fourth end, the second stripline having a width that tapers to a point at the third end and having a fourth width at the fourth end.

22. The impedance matching device of claim 21, wherein the first impedance is approximately 100,000,000 Ohms.

23. The impedance matching device of claim 22, wherein the second impedance is approximately 50 Ohms.

24. The impedance matching device of claim 21, wherein the first stripline tapers linearly from the point at the first end to the second width at the second end.

25. The impedance matching device of claim 21, wherein the first stripline tapers exponentially from the point at the first end to the second width at the second end.

26. The impedance matching device of claim 21, wherein the first stripline tapers according to a Gaussian taper from the point at the first end to the second width at the second end.

27. The impedance matching device of claim 21, wherein the first stripline tapers according to a Dolph-Chebyshev taper from the point at the first end to the second width at the second end.

28. The impedance matching device of claim 21, wherein the first stripline tapers according to a Klopfenstein taper from the point at the first end to the second width at the second end.

29. For use with an optoelectronic device comprising an evacuated chamber having a first negatively-biased source electrode, a second negatively-biased source electrode and a collector electrode disposed therein, wherein the source and collector electrodes have a first impedance, a laser generator adapted to emit radiation that is focused on the source electrode to stimulate emission of rapidly varying electrical current from the first and second source electrodes, and a connector adapted to couple to a second impedance, an impedance matching device adapted to match the first impedance to the second impedance, comprising:

a first stripline having a first end and a second end, the first stripline having a width that tapers to a first point at the first end, wherein the first point forms the first source electrode having the first impedance, and wherein the first stripline has a second width at the second end that is coupled to the connector that is adapted to couple to the second impedance;

a second stripline having a third end and a fourth end, the second stripline having a width that tapers to a second point at the third end, wherein the second point forms the second source electrode having the first impedance, and wherein the second stripline has a fourth width at the fourth end that is coupled to the connector that is adapted to couple to the second impedance; and

a third stripline having a fifth end and a sixth end forming the collector electrode.

30. The impedance matching device of claim 29, wherein the first impedance is approximately 100,000,000 Ohms.

31. The impedance matching device of claim 29, wherein the second impedance is approximately 50 Ohms.

32. The impedance matching device of claim 29, wherein the first and second striplines taper linearly from the first and second points to the second and fourth widths at the second and fourth ends.

33. The impedance matching device of claim 29, wherein the first and second striplines taper exponentially from the first and second points to the second and fourth widths at the second and fourth ends.

34. The impedance matching device of claim 29, wherein the first and second striplines taper according to a Gaussian taper from the first and second points to the second and fourth widths at the second and fourth ends.

35. The impedance matching device of claim 29, wherein the first and second striplines taper according to a Dolph-Chebyshev taper from the first and second points to the second and fourth widths at the second ends.

36. The impedance matching device of claim 29, wherein the first and second striplines taper according to a Klopfenstein taper from the first and second points to the second and fourth width at the second and fourth ends.